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LAKE HICKORY, ALEXANDER, CALDWELL, AND CATAWBA COUNTIES, NORTH CAROLINA

Pacific Northwest Environmental Research Laboratory

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June 1975

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

REPORT

ON

LAKE HICKORY

ALEXANDER, CALDWELL,

AND CATAWBA COUNTIES

NORTH CAROLINA

EPA REGION IV

WORKING PAPER No. 380

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LABORATORY

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WITH THE COOPERATION OF THE

NORTH CAROLINA DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES

AND THE

NORTH CAROLINA NATIONAL GUARD

JUNE, 1975

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the North Carolina Department of Natural and Economic Resources for professional involvement and to the North Carolina National Guard for conducting the tributary sampling phase of the Survey.

Lewis R. Martin, Director of the Division of Environmental Management; Darwin L. Coburn, Chief of the Water Quality Section; and Julian R. Taylor, Supervisor of the Monitoring Program Unit; provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

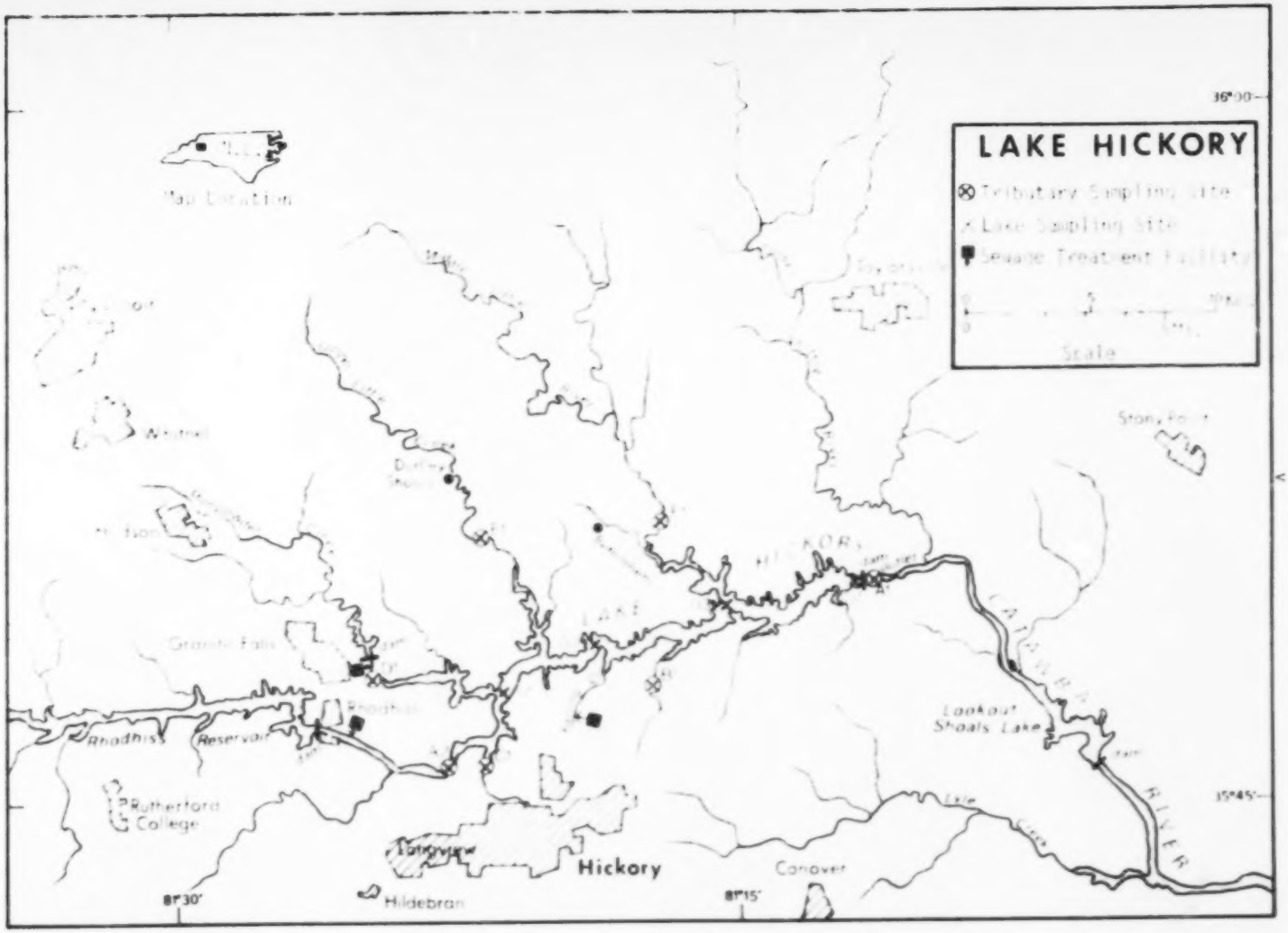
Major General William M. Buck, formerly Adjutant General of North Carolina, and Project Officer Colonel Arthur J. Bouchard, who directed the volunteer efforts of the North Carolina National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NORTH CAROLINA

LAKE NAME	COUNTY
Badin	Montgomery, Stanly
Blewett Falls	Anson, Richmond
Chatuge	Clay, NC; Towns, GA
Fontana	Graham, Swain
Hickory	Alexander, Caldwell, Catawba
High Rock	Davidson, Rowan
Hiwassee	Cherokee
James	Burke, McDowell
John H. Kerr (Nut Bush Creek)	Granville, Vance, Warren, NC; Halifax, Mecklenburg, VA
Junaluska	Haywood
Lookout Shoals	Alexander, Catawba, Iredell
Mountain Island	Gaston, Mecklenburg
Norman	Catawba, Iredell, Lincoln, Mecklenburg
Rhodhiss	Burke, Caldwell
Santeetlah	Graham
Tillery	Montgomery, Stanly
Waccamaw	Columbus
Waterville	Haywood
Wylie	Gaston, Mecklenburg, NC; York, SC


LAKE HICKORY
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Scale
Map Location
36°00'
35°45'
81°30'
81°15'
Granite Falls
Rhodhiss
Rhodhiss Reservoir
Lookout Shoals Lake
Lake Hickory
Catawba River
Lake Creek
Rutherford College
Fairview
Hickory
Hildebran
Conover

HICKORY LAKE

STORET NO. 3705

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Lake Hickory is eutrophic. However, since the mean hydraulic retention time of the lake is a rather short 33 days, it more closely resembles a slow-moving river; and the term "over-enriched" may be a more appropriate description of the condition of the lake.

Lake Hickory ranked tenth in overall trophic quality when the 16 North Carolina lakes sampled in 1973 were compared using a combination of six parameters*. Eleven of the lakes had less median total phosphorus, seven had less and two had the same median dissolved phosphorus, six had less median inorganic nitrogen, 13 had less mean chlorophyll a, and seven had greater mean Secchi disc transparency. Depression of dissolved oxygen with depth occurred at all four sampling stations in July and September.

Survey limnologists noted that the water was turbid on all sampling occasions. No algal blooms were observed, although phytoplankton numbers in September indicate a near-bloom condition, and blue-green genera were dominant.

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* See Appendix A.

B. Rate-Limiting Nutrient:

The algal assay results show that Lake Hickory was phosphorus limited at the time the sample was collected. The lake data also indicate phosphorus limitation at all stations and sampling times (the mean N/P ratios were 18/1 or greater, and phosphorus limitation would be expected).

C. Nutrient Controllability:

1. Point sources--During the sampling year, it is estimated tnat the phosphorus contribution of known point sources amounted to 11.0% of the total load reaching the lake.

The calculated phosphorus loading rate of 6.08 $g/m^2/yr$ is three times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic rate (see page 14). However, because of the relatively short hydraulic retention time of Lake Hickory, Vollenweider's model may not be applicable. Nonetheless, the existing trophic condition of the lake is evidence of excessive nutrient loads.

Because Lake Hickory is phosphorus limited, point-source phosphorus control would be expected to result in an improved trophic condition, particularly if the point sources impacting upstream Rhodhiss Lake* are also controlled.

* Working Paper No. 388.

It is likely that point-source phosphorus control would benefit downstream Lookout Shoals Lake* as well.

2. Non-point sources--The Catawba River accounted for about 89% of the total phosphorus load to Lake Hickory during the sampling year and had a phosphorus export rate of 29 $kg/km^2/yr$ (see page 14). The export rate of the unnamed stream at station C-1 was a relatively high 44 kg $P/km^2/yr$ and probably was due to urban drainage from the City of Hickory. However, the total phosphorus contribution of the stream was only 0.3% of the total phosphorus load to the lake.

* Working Paper No. 385.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 16.63 kilometers^2.
2. Mean depth: 9.5 meters.
3. Maximum depth: >25.9 meters.
4. Volume: 157 x 10^6 m^3.
5. Mean hydraulic retention time: 33 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Catawba River	2,880.1	50.0
Unnamed Creek (B-1)	12.9	0.2
Unnamed Creek (C-1)	7.0	0.1
Gunpowder Creek	93.2	1.0
Upper Little River	25.9	0.3
Middle Little River	129.5	1.7
Minor tributaries & immediate drainage -	227.7	2.6
Totals	3,376.3	55.9

2. Outlet -

Catawba River	3,392.9**	55.9**

C. Precipitation***:

1. Year of sampling: 148.9 centimeters.
2. Mean annual: 119.9 centimeters.

† Table of metric conversions--Appendix B.
†† Park, 1974.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake; outflow adjusted to equal sum of inflows.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Lake Hickory was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the four stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll *a* analysis. The maximum depths sampled were 13.4 meters at station 1, 16.2 meters at station 2, 12.2 meters at station 3, and 25.9 meters at station 4.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE HICKORY
STORET CODE 3705

PARAMETER	1ST SAMPLING (3/30/73) 4 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (/ /1973) 4 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (9/24/73) 4 SITES RANGE	MEAN	MEDIAN
TEMP (C)	10.5 - 13.2	11.4	11.8	15.5 - 28.5	24.6	24.5	14.3 - 26.5	22.4	23.3
DISS OXY (MG/L)	7.2 - 7.8	7.6	7.6	0.0 - 9.8	5.0	4.6	0.0 - 10.0	5.0	5.0
CNDCTVY (MCROMO)	50. - 70.	62.	60.	50. - 90.	57.	55.	93. - 134.	54.	49.
PH (STAND UNITS)	7.1 - 7.7	7.4	7.5	6.3 - 9.0	7.1	6.7	6.2 - 8.3	6.9	6.6
TOT ALK (MG/L)	10. - 10.	10.	10.	10. - 27.	13.	12.	13. - 37.	18.	17.
TOT P (MG/L)	0.044 - 0.117	0.084	0.080	0.016 - 0.054	0.036	0.031	0.014 - 0.085	0.041	0.043
ORTHO P (MG/L)	0.008 - 0.024	0.013	0.013	0.003 - 0.010	0.005	0.005	0.005 - 0.012	0.008	0.008
NO2+NO3 (MG/L)	0.220 - 0.310	0.254	0.250	0.050 - 0.250	0.131	0.150	0.030 - 0.100	0.064	0.070
AMMONIA (MG/L)	0.080 - 0.150	0.110	0.100	0.070 - 1.300	0.232	0.190	0.050 - 0.300	0.175	0.140
KJEL N (MG/L)	0.200 - 0.300	0.225	0.200	0.200 - 1.500	0.532	0.460	0.500 - 4.000	0.774	0.500
ORGNC N (MG/L)	0.120 - 0.420	0.234	0.150	0.130 - 1.380	0.363	0.340	0.040 - 0.340	0.434	0.220
TOTAL N (MG/L)	0.420 - 0.730	0.483	0.450	0.240 - 1.580	0.663	0.560	0.570 - 4.040	0.838	0.580
CHLRPHYL A (UG/L)	1.4 - 5.0	3.3	3.2	2.4 - 11.1	6.3	5.0	8.4 - 14.2	12.2	12.4
SECCHI (METERS)	1.0 - 1.0	1.0	1.0	0.9 - 1.2	1.1	1.2	1.1 - 1.5	1.3	1.1

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal units per ml
03/30/73	1. Melosira	353
	2. Flagellates	181
	3. Asterionella	57
	4. Synedra	19
	5. Ankistrodesmus	19
	Other genera	19
	Total	648
07/07/73	1. Anabaena	460
	2. Flagellates	371
	3. Oscillatoria	300
	4. Melosira	265
	5. Cyclotella	141
	Other genera	566
	Total	2,103
09/24/73	1. Blue-green filaments	1,671
	2. Raphidiopsis	789
	3. Flagellates	464
	4. Anabaena	449
	5. Lyngbya	418
	Other genera	1,470
	Total	5,261

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
03/30/73	01	4.7
	02	5.5
	03	1.7
	04	1.2
07/07/73	01	11.1
	02	5.4
	03	2.9
	04	5.8
09/24/73	01	14.0
	02	11.9
	03	14.2
	04	8.9

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.016	0.276	3.9
0.050 P	0.066	0.276	7.8
0.050 P + 1.0 N	0.066	1.276	23.8
1.0 N	0.016	1.276	3.9

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Hickory Lake was high at the time the assay sample was collected (03/30/73). Also, the N/P ratio of the control sample and the response to the phosphorus only spike show that the lake was phosphorus limited at that time. Note

that the yield resulting from the nitrogen only spike was essentially the same as the control yield.

The lake data indicate phosphorus limitation at all stations and sampling times; i.e., the mean N/P ratios were 18/1 or greater, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the North Carolina National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of January and March, 1974, when two samples were collected. Sampling was begun in March, 1973, and was completed in March, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the North Carolina District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

The inlet of Lookout Shoals Lake and the outlet of Lake Hickory were sampled in the same place but not at the same time. For consistency, the nutrient loads for the outlet of Lake Hickory (3705A1) were calculated using the concentrations and flows measured at the inlet of Lookout Shoals Lake (3710A2). These data are included in Appendix E.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the

* See Working Paper No. 175.

nutrient loads, in kg/km^2/year, at stations B-1, E-1, and F-1 and multiplying the means by the ZZ area in km^2.

The operator of the Granite Falls wastewater treatment plant provided monthly effluent samples and corresponding flow data. The operator of the Hickory southeast wastewater treatment plant also provided monthly samples and corresponding flow data. However, it was learned that this plant discharges to Clark Creek which is not a tributary of Lake Hickory. However, the obtained data are included in Appendix D.

The operator of the Hickory northeast wastewater treatment plant did not participate, but the plant does impact Lake Hickory (Kirby, 1974), and nutrient loads from this source were estimated at 1.134 kg P and 3.401 kg N/capita/year. The Town of Rhodhiss also did not participate in the sampling program, and nutrient loads were estimated using the factors given above.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Granite Falls†	3,000	act. sludge	1,127.9	Little Gunpowder River
Rhodhiss*	784	sand filter	296.7**	Catawba River
Hickory NE plant*	5,000	trickling filter	1,892.5**	Falling Creek

2. Known industrial - None

† Treatment plant questionnaire.
* Anonymous, 1971.
** Estimated at 0.3785 m^3/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Catawba River	83,775	82.9
Unnamed Creek (B-1)	235	0.2
Unnamed Creek (C-1)	310	0.3
Gunpowder Creek	235	0.2
Upper Little River	170	0.2
Middle Little River	1,985	2.0
b. Minor tributaries & immediate drainage (non-point load) -	3,050	3.0
c. Known municipal STP's -		
Granite Falls	4,455	4.4
Rhodhiss	890	0.9
Hickory	5,670	5.6
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	290	0.3
Total	101,065	100.0

2. Outputs -

Lake outlet - Catawba River 71,355

3. Net annual P accumulation - 29,710 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Catawba River	1,613,905	88.7
Unnamed Creek (B-1)	7,950	0.4
Unnamed Creek (C-1)	5,475	0.3
Gunpowder Creek	22,160	1.2
Upper Little River	8,385	0.5
Middle Little River	27,720	1.5
b. Minor tributaries & immediate drainage (non-point load) -	87,595	4.8
c. Known municipal STP's -		
Granite Falls	7,785	0.4
Rhodhiss	2,665	0.2
Hickory	17,005	1.0
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	17,955	1.0
Total	1,818,600	100.0

2. Outputs -

Lake outlet - Catawba River 1,155,610

3. Net annual N accumulation - 662,990 kg.

* See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Catawba River	29	560
Unnamed Creek (B-1)	18	616
Unnamed Creek (C-1)	44	782
Gunpowder Creek	3	238
Upper Little River	7	324
Middle Little River	15	214

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m²/yr	6.08	1.79	109.4	39.9

Vollenweider loading rates for phosphorus (g/m²/yr) based on mean depth and mean hydraulic retention time of Lake Hickory:

"Dangerous" (eutrophic rate)	1.94
"Permissible" (oligotrophic rate)	0.97

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	3719	LAKE WACCAMAW	534
2	3716	SANTEELAH LAKE	446
3	3711	MOUNTAIN ISLAND LAKE	419
4	3707	HIWASSEE LAKE	414
5	3704	FONTANA LAKE	392
6	3713	LAKE NORMAN	346
7	3708	LAKE JAMES	334
8	3710	LOOKOUT SHOALS	327
9	3715	RHODHISS LAKE	296
10	3705	LAKE HICKORY	283
11	3717	LAKE TILLERY	246
12	3709	LAKE JUNALUSKA	220
13	3702	BLEWETT FALLS LAKE	200
14	3718	WATERVILLE RESERVOIR	140
15	3701	BADIN LAKE	124
16	3706	HIGH ROCK LAKE	76

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
3701	BADIN LAKE	33 (5)	7 (1)	27 (4)	27 (4)	3 (0)	27 (4)	124
3702	BLEWETT FALLS LAKE	7 (1)	13 (2)	7 (1)	73 (11)	93 (14)	7 (1)	200
3704	FONTANA LAKE	100 (15)	33 (5)	93 (14)	100 (15)	3 (0)	63 (9)	392
3705	LAKE HICKORY	27 (4)	60 (9)	53 (8)	13 (2)	80 (12)	50 (7)	283
3706	HIGH ROCK LAKE	13 (2)	20 (3)	0 (0)	0 (0)	23 (2)	20 (3)	76
3707	HIWASSEE LAKE	87 (13)	80 (12)	87 (13)	47 (7)	50 (7)	63 (9)	414
3708	LAKE JAMES	60 (9)	87 (13)	80 (12)	7 (1)	23 (2)	77 (11)	334
3709	LAKE JUNALUSKA	47 (7)	27 (4)	43 (6)	20 (3)	50 (7)	33 (5)	220
3710	LOOKOUT SHOALS	53 (8)	47 (7)	60 (9)	67 (10)	60 (9)	40 (6)	327
3711	MOUNTAIN ISLAND LAKE	73 (11)	73 (11)	43 (6)	53 (8)	87 (13)	90 (13)	419
3713	LAKE NORMAN	67 (10)	53 (8)	73 (11)	40 (6)	23 (2)	90 (13)	346
3715	RHODHISS LAKE	20 (3)	67 (10)	33 (5)	93 (14)	70 (10)	13 (2)	296
3716	SANTEELAH LAKE	93 (14)	93 (14)	100 (15)	60 (9)	23 (2)	77 (11)	446
3717	LAKE TILLERY	40 (6)	40 (6)	13 (2)	33 (5)	70 (10)	50 (7)	246
3718	WATERVILLE RESERVOIR	0 (0)	0 (0)	20 (3)	80 (12)	40 (6)	0 (0)	140
3719	LAKE WACCAMAW	80 (12)	100 (15)	67 (10)	87 (13)	100 (15)	100 (15)	534

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
3701	BADIN LAKE	0.042	0.680	466.750	7.190	14.900	0.012
3702	BLEWETT FALLS LAKE	0.090	0.655	476.889	4.167	10.800	0.034
3704	FONTANA LAKE	0.011	0.550	392.650	3.438	14.900	0.007
3705	LAKE HICKORY	0.047	0.320	461.000	7.275	13.400	0.008
3706	HIGH ROCK LAKE	0.090	0.580	477.454	14.283	14.800	0.017
3707	HIWASSEE LAKE	0.015	0.240	420.555	5.678	14.200	0.007
3708	LAKE JAMES	0.020	0.160	428.866	7.660	14.800	0.006
3709	LAKE JUNALUSKA	0.031	0.560	462.000	7.233	14.200	0.009
3710	LOOKOUT SHOALS	0.026	0.370	459.167	4.200	13.800	0.008
3711	MOUNTAIN ISLAND LAKE	0.018	0.270	462.000	5.580	12.800	0.005
3713	LAKE NORMAN	0.019	0.330	446.667	5.807	14.800	0.005
3715	RHODHISS LAKE	0.061	0.305	462.111	3.578	13.600	0.019
3716	SANTEELAH LAKE	0.011	0.160	366.400	5.360	14.800	0.006
3717	LAKE TILLERY	0.040	0.470	468.600	6.827	13.600	0.008
3718	WATERVILLE RESERVOIR	0.103	0.860	468.333	3.817	14.400	0.041
3719	LAKE WACCAMAW	0.018	0.120	455.667	3.583	9.800	0.004

APPENDIX B

CONVERSIONS FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NORTH CAROLINA 10/21/75

LAKE CODE 3705 LAKE HICKORY

TOTAL DRAINAGE AREA OF LAKE(SQ MI) 1310.00

TRIBUTARY	SUB-DRAINAGE AREA(SQ MI)	NORMALIZED FLOWS(CFS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3705A1	1310.00	2040.00	2130.00	2340.00	1790.00	1780.00	1760.00	1530.00	1690.00	1520.00	1930.00	1830.00	2110.00	1870.30
3705A2	1112.00	1930.00	1920.00	2140.00	1700.00	1670.00	1640.00	1440.00	1630.00	1510.00	1820.00	1790.00	2010.00	1766.58
3705B1	5.00	7.80	10.00	11.00	9.90	7.10	6.20	5.00	5.60	5.70	6.10	5.30	6.80	7.19
3705C1	2.70	4.60	6.20	6.40	5.80	4.20	3.60	2.90	3.30	3.30	3.60	3.10	4.00	4.24
3705D1	36.00	36.00	42.00	45.00	48.00	34.00	31.00	27.00	25.00	26.00	27.00	26.00	35.00	33.44
3705E1	10.00	12.00	16.00	17.00	19.00	11.00	10.00	8.00	7.20	7.50	8.30	7.60	11.00	11.18
3705F1	50.00	55.00	80.00	90.00	90.00	60.00	45.00	50.00	45.00	40.00	45.00	50.00	55.00	58.60
3705ZZ	94.30	95.00	120.00	130.00	100.00	90.00	80.00	80.00	85.00	85.00	75.00	80.00	95.00	92.77

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1310.00
SUM OF SUB-DRAINAGE AREAS = 1310.00

TOTAL FLOW IN = 23694.05
TOTAL FLOW OUT = 22450.00

MEAN MONTHLY FLOWS AND DAILY FLOWS(CFS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3705A1	3	73	5380.00	25	4910.00				
	4	73	4640.00	26	3000.00				
	5	73	5810.00	25	2090.00				
	6	73	3410.00						
	7	73	2450.00	3	5090.00				
	8	73	3100.00	1	2780.00	31	1950.00		
	9	73	2150.00	28	2820.00				
	10	73	1900.00						
	11	73	1530.00	1	1620.00				
	12	73	3080.00	4	2710.00				
	1	74	3960.00	7	4360.00	23	4720.00		
	2	74	3200.00	13	3310.00				
	3	74	2680.00	5	3750.00				
3705A2	3	73	4900.00	25	4600.00				
	4	73	4060.00	26	4100.00				
	5	73	4370.00	26	690.00				
	6	73	3100.00						
	7	73	2300.00	2	3970.00				
	8	73	2750.00	1	2250.00	31	2250.00		
	9	73	2070.00	28	2850.00				
	10	73	1830.00						
	11	73	1550.00	1	2000.00				
	12	73	2960.00	4	2980.00				
	1	74	3560.00	7	3900.00	23	4270.00		
	2	74	3080.00	13	3010.00				
	3	74	2620.00	5	3720.00				

TRIBUTARY FLOW INFORMATION FOR NORTH CAROLINA 10/21/75

LAKE CODE 3705 LAKE HICKORY

MEAN MONTHLY FLOWS AND DAILY FLOWS(CFS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3705B1	3	73	24.00	25	18.00				
	4	73	19.00	26	12.00				
	5	73	18.00	25	11.00				
	6	73	11.00						
	7	73	7.60	3	8.80				
	8	73	6.60	1	8.40	31	4.60		
	9	73	4.80	28	4.30				
	10	73	5.20						
	11	73	4.30	1	4.20				
	12	73	13.00	4	3.90				
	1	74	14.00	7	10.00	23	15.00		
	2	74	12.00	13	9.50				
	3	74	11.00	5	8.50	24	8.70		
3705C1	3	73	13.00	25	9.00				
	4	73	10.00	26	6.60				
	5	73	9.60	26	5.30				
	6	73	5.80						
	7	73	4.10	2	5.00				
	8	73	3.60	1	4.60	31	2.50		
	9	73	2.60	28	2.30				
	10	73	2.80						
	11	73	2.30	1	2.30				
	12	73	7.00	4	2.10				
	1	74	7.30	7	5.40	23	8.00		
	2	74	6.60	13	5.10				
	3	74	5.70	5	4.50	24	4.70		
3705D1	3	73	68.00	25	54.00				
	4	73	78.00	26	81.00				
	5	73	59.00	26	35.00				
	6	73	43.00						
	7	73	33.00	2	37.00				
	8	73	37.00	1	42.00	31	26.00		
	9	73	25.00	28	23.00				
	10	73	26.00						
	11	73	26.00	1	26.00				
	12	73	45.00	4	50.00				
	1	74	48.00	7	42.00	23	52.00		
	2	74	45.00	13	40.00				
	3	74	44.00	5	33.00	24	42.00		
3705E1	3	73	32.00	25	23.00				
	4	73	37.00	26	43.00				
	5	73	26.00	26	15.00				
	6	73	16.00						
	7	73	11.00	2	13.00				
	8	73	13.00	1	16.00	31	7.70		
	9	73	7.20	28	6.40				
	10	73	7.70						
	11	73	7.80	1	7.70				
	12	73	21.00	4	7.00				
	1	74	19.00	7	16.00	23	22.00		
	2	74	18.00	13	14.00				
	3	74	17.00	5	11.00	24	16.00		

24

TRIBUTARY FLOW INFORMATION FOR NORTH CAROLINA 10/21/75

LAKE CODE 3705 LAKE HICKORY

MEAN MONTHLY FLOWS AND DAILY FLOWS(CFS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3705F1	3	73	160.00	24	100.00				
	4	73	180.00	15	95.00				
	5	73	130.00	20	80.00				
	6	73	95.00	23	82.00				
	7	73	55.00	24	52.00				
	8	73	65.00	19	110.00				
	9	73	35.00	28	32.00				
	10	73	35.00	21	32.00				
	11	73	30.00	11	32.00				
	12	73	90.00	16	50.00				
	1	74	90.00	5	100.00	19	50.00		
	2	74	85.00	9	115.00				
	3	74	80.00	24	80.00				
3705ZZ	3	73	190.00						
	4	73	210.00						
	5	73	200.00						
	6	73	190.00						
	7	73	95.00						
	8	73	125.00						
	9	73	55.00						
	10	73	75.00						
	11	73	70.00						
	12	73	200.00						
	1	74	210.00						
	2	74	150.00						
	3	74	145.00						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STREET [illegible]

37030I
35 47 00.0 080 21 15.0
LAKE NORMAN
37035 NORTH CAROLINA

11FEB85
5

2111202
0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	SAMPLING AGENCY CODE	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/10	13 30	0000	12.7		32	56L	7.70	10K	0.050	0.200	0.310	0.005
	13 30	0004	11.1	9.5		56L	7.50	10K	0.050	0.200K	0.200	0.011
	13 30	0013	10.1	9.5		55	7.60	10K	0.050	0.200K	0.230	0.018
	13 30	0044	10.1	9.4		55	7.60	10K	0.050	0.200K	0.220	0.014
73/04/07	15 00	0000	24.0		36	55	9.00	11	0.050	0.400	0.080	0.006
	15 00	0003	21.7	9.6		56L	8.20	10	0.070	0.500	0.060	0.005
	15 00	0013	20.9	7.1		57	8.00	11	0.100	0.600	0.100	0.010
	15 00	0044	22.2	5.1		57	6.70	13	0.190	0.500	0.180	0.007
73/04/24	15 30	0000	20.0	15.0	48	48	7.50	13	0.050	0.700	0.040	0.009
	15 30	0005	20.0	7.6		46	6.90	13	0.060	0.600	0.050	0.009
	15 30	0013	23.4	5.9		47	6.50	14	0.090	0.400	0.070	0.009
	15 30	0043	22.4	5.6		47	6.30	14	0.110	0.400	0.080	0.008
	15 30	0049	22.4	5.2		48	6.20	15	0.150	0.400	0.090	0.009

DATE FROM TO	TIME OF DAY	DEPTH FEET	[illegible] PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/10	13 30	0000	[illegible]	9.7
	13 30	0004	[illegible]	
	13 30	0013	[illegible]	
	13 30	0044	[illegible]	
73/04/07	15 00	0000	[illegible]	11.1
	15 00	0003	[illegible]	
	15 00	0013	[illegible]	
	15 00	0044	[illegible]	
73/04/24	15 30	0000	[illegible]	14.0
	15 30	0005	[illegible]	
	15 30	0013	[illegible]	
	15 30	0043	[illegible]	
	15 30	0049	[illegible]	

K VALUE KNOWN TO BE
LESS THAN INDICATED

L ACTUAL VALUE IS KNOWN TO BE
GREATER THAN VALUE GIVEN

STREET REMEDIAL DATE 7/21/78

37030?
35 4M 30.0 082 1M 30.0
LAKE HICKORY
37035 NORTH CAROLINA

FEMALES
5

2111202
0353 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
7/06/78	14 00	0000	32.7		17	70	7.10	10	0.150	0.300	0.260	0.023
	14 00	0004	32.7	9.1		56K	7.30	10K	0.140	0.200	0.260	0.020
	14 00	0015	32.1	9.0		56K	7.00	10K	0.080	0.200K	0.260	0.012
	14 00	0030	31.0	9.0		50K	7.00	10K	0.060	0.200K	0.230	0.013
	14 00	0050	31.0	9.0		50K	7.00	10K	0.050	0.200K	0.240	0.013
7/07/78	14 20	0000	29.1		4M	53	6.80	11	0.100	0.700	0.080	0.005
	14 20	0004	27.3	7.0		53	7.20	11	0.100	0.400	0.100	0.004
	14 20	0015	26.5	5.5		55	6.50	11	0.140	0.400	0.150	0.006
	14 20	0030	25.1	4.8		63	6.50	11	0.280	0.700	0.170	0.007
	14 20	0050	24.7	4.0		63	6.50	13	0.450	0.400	0.160	0.008
7/14/78	15 00	0000	25.7	4.5	4M	4M	7.30	17	0.060	0.900	0.030	0.004
	15 00	0015	24.5	5.0		45	6.90	15	0.120	0.400	0.050	0.006
	15 00	0030	22.6	5.0		4M	6.90	17	0.140	0.400	0.080	0.012
	15 00	0047	22.4	4.8		49	6.90	16	0.150	0.500	0.090	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00410 T ALK CACO3 MG/L	82217 CHLOPHYL A MG/L
7/06/78	14 00	0000	10	3.9
	14 00	0004	10K	
	14 00	0015	10K	
	14 00	0030	10K	
	14 00	0050	10K	
7/07/78	14 20	0000	11	4.7
	14 20	0004	11	
	14 20	0015	11	
	14 20	0030	11	
	14 20	0050	13	
7/14/78	15 00	0000	17	11.4
	15 00	0015	15	
	15 00	0030	17	
	15 00	0047	16	

K VALUE KNOWN TO BE
LESS THAN INDICATED

28

STORET RETRIEVAL DATE 75/10/20

370503
35 47 55.0 082 15 00.0
LAKE HICKORY
37035 NORTH CAROLINA

11EPALES 2111202
3 0039 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/30	14	40 0000	13.2		18	50K	7.60	10K	0.120	0.200	0.270	0.013
	14	40 0004	12.9	9.3		50K	7.60	10K	0.090	0.200K	0.250	0.008
	14	40 0015	12.4	9.4		50K	7.60	10K	0.110	0.200K	0.250	0.009
	14	40 0035	11.3	9.0		50K	7.50	10K	0.060	0.200K	0.260	0.013
73/07/07	13	35 0000	24.5		48	54	8.70	14	0.100	0.700	0.070	0.006
	13	35 0005	27.9	8.0		50L	7.20	12	0.080	0.300	0.090	0.004
	13	35 0015	23.7	4.5		58	6.50	12	0.220	0.300	0.170	0.007
	13	35 0040	22.4	3.6		60	6.50	14	0.250	0.400	0.170	0.008
73/09/24	14	25 0000	25.5	4.0	42	43	8.30	17	0.090	0.900	0.030	0.008
	14	25 0015	23.4	5.0		44	7.00	18	0.130	0.500	0.060	0.005
	14	25 0025	23.3	3.8		47	6.60	18	0.180	0.300	0.070	0.006
	14	25 0038	23.0	4.0		48	6.50	18	0.220	0.400	0.070	0.008

K VALUE KNOWN TO BE
LESS THAN INDICATED

L ACTUAL VALUE IS KNOWN TO BE
GREATER THAN VALUE GIVEN

STORET RETRIEVAL DATE 75/10/20

370503
35 47 55.0 042 15 00.0
LAKE HICKORY
37035 NORTH CAROLINA

11EPALES 2111202
3 0034 FEET DEPTH

30

DATE FROM TO	TIME OF DAY	DEPTH FEET	PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/30	14 40 0000	.000		1.7
	14 40 0005	.049		
	14 40 0015	.098		
	14 40 0030	.067		
73/07/07	13 35 0000	.031		2.9
	13 35 0005	.024		
	13 35 0015	.024		
	13 35 0030	.023		
73/10/24	14 25 0000	.033		14.2
	14 25 0015	.023		
	14 25 0025	.023		
	14 25 0035	.043		

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STORET RETRIEVAL DATE 75/10/20

370504
35 47 45.0 082 11 30.0
LAKE HICKORY
37003 NORTH CAROLINA

11EPALES 2111202
3 0090 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/30	15 05	0000	12.5		17	50K	7.70	10K	0.140	0.300	0.260	0.015
	15 05	0004	12.4	8.6		50K	7.60	10K	0.150	0.300	0.270	0.014
	15 05	0015	11.8	8.6		50K	7.60	10K	0.140	0.300	0.260	0.013
	15 05	0035	11.3	8.8		50K	7.60	10K	0.110	0.200	0.240	0.015
	15 05	0060	11.0	8.9		50K	7.60	10K	0.120	0.200	0.250	0.012
	15 05	0085	10.7	8.2		50K	7.50	10K	0.100	0.300	0.240	0.011
73/07/07	10 50	0000	27.2		48	50L	7.30	12	0.080	0.400	0.080	0.005
	10 50	0004	26.7	7.2		50L	6.90	14	0.070	0.200K	0.090	0.004
	10 50	0016	23.4	3.9		55	6.50	14	0.190	0.200	0.160	0.004
	10 50	0030	22.4	3.9		55	6.40	14	0.240	0.300	0.190	0.006
	10 50	0060	21.6	2.2		59	6.30	14	0.250	0.300	0.250	0.004
	10 50	0085	15.5	0.6		90	6.80	27	1.300	1.500	0.080	0.003
73/09/24	12 05	0000	25.3	7.8	72	45	7.20	17	0.050	0.700	0.030	0.008
	12 05	0020	23.6	1.7		50	6.40	19	0.220	0.400	0.100	0.007
	12 05	0040	22.9	2.8		51	6.30	18	0.230	0.400	0.090	0.012
	12 05	0065	22.5	1.6		53	6.30	18	0.300	0.600	0.090	0.011
	12 05	0075	17.6	0.0		88	6.40	26	1.480	1.800	0.030	0.006
	12 05	0083	14.3	0.0		134	6.70	37	3.300	4.000	0.040	0.005

K VALUE KNOWN TO BE
LESS THAN INDICATED

L ACTUAL VALUE IS KNOWN TO BE
GREATER THAN VALUE GIVEN

STORET RETRIEVAL DATE 75/10/20

370504
35 47 45.0 082 11 30.0
LAKE HICKORY
37003 NORTH CAROLINA

11EPALES
3

2111202
0090 FEET DEPTH

-32-

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/30	15 05 0000		0.050	1.2
	15 05 0004		0.059	
	15 05 0015		0.062	
	15 05 0035		0.057	
	15 05 0060		0.054	
	15 05 0085		0.087	
73/07/07	10 50 0000		0.025	5.8
	10 50 0004		0.031	
	10 50 0015		0.016	
	10 50 0030		0.014	
	10 50 0060		0.023	
	10 50 0085		0.049	
73/04/24	12 05 0000		0.021	4.5
	12 05 0020		0.014	
	12 05 0040		0.024	
	12 05 0065		0.041	
	12 05 0075		0.033	
	12 05 0083		0.055	

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/10/20

37035A1 L5370SA1
35 49 30.0 081 11 30.0
CATAWBA RIVER
37173 MAP CATAWBA CO
O/LAKE HICKORY
HWY 16 BRDG JUST BELO LAKE HICKORY DAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/25	10 40		0.210	0.440	0.105	0.022	0.080
73/04/26			0.180	4.300	0.140	0.013	0.035
73/05/25	16 20		0.126	3.700	0.180	0.013	0.027
73/07/03	14 10		0.098	0.340	0.140	0.007	0.020
73/08/01	17 40		0.102	0.400	0.205	0.005K	0.025
73/08/31	17 05		0.094	0.360	0.220	0.005K	0.015
73/11/01	16 50		0.088	0.650	0.210	0.011	
73/12/04	16 05		0.096	0.700	0.096	0.005K	0.025
74/01/07			0.250	0.400	0.076	0.020	0.065
74/01/23	15 55		0.276	0.200	0.076	0.025	0.050
74/02/13	17 00		0.276	0.200	0.060	0.025	0.045
74/03/05	16 00		0.216	0.500	0.030	0.020	0.045
74/03/24	16 00		0.164	1.200	0.065	0.020	0.055

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 73/10/20

3705A2 LS3705A2
35 45 30.0 081 22 30.0
CATAWBA RIVER
37 MAP CALDWELL CO
1/LAKE HICKORY
US RT 321 BRDG 3.5 MI SE GRANITE FALLS
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/25			0.210	0.440	0.054	0.013	0.050
73/04/26			0.140	2.900	0.105	0.023	0.080
73/05/26	12 45		0.090	1.800	0.050	0.014	0.045
73/07/02	16 10		0.126	1.400	0.160	0.010	0.045
73/08/01	16 20		0.126	0.460	0.088	0.005K	0.040
73/08/31	15 30		0.092	0.315	0.066	0.005K	0.035
73/11/01	15 45		0.054	0.800	0.176	0.010	
73/12/04	15 00		0.116	0.700	0.088	0.016	0.047
74/01/07	15 15		0.264	0.600	0.068	0.020	0.080
74/01/23	14 45		0.224	0.400	0.048	0.024	0.060
74/02/13	14 15		0.240	0.200	0.035	0.025	0.060
74/03/05	14 55		0.200	0.500	0.025	0.020	0.055
74/03/24	15 00		0.176	0.400	0.060	0.010	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

3710A2 LS3710A2
35 49 30.0 081 11 30.0
CATAWBA RIVER
37 MAP CATAWBA CO
I/LOOKOUT SHOALS RESVR
HWY 16 BRDG JUST BELO LAKE HICKORY DAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	11 10		0.200	0.350	0.087	0.022	0.065
73/04/15	12 45		0.231	0.285	0.063	0.022	0.045
73/05/20	12 30		0.147	0.500	0.084	0.013	0.040
73/06/23	10 00		0.130	0.580	0.230	0.005K	0.020
73/07/24	20 30		0.138	3.200	0.273	0.005K	0.020
73/08/19	10 30		0.110	0.610	0.150	0.005K	0.025
73/10/21	10 45		0.089	1.250	0.154	0.013	
73/11/18	15 15		0.104	0.350	0.080	0.012	0.032
73/12/16	10 55		0.108	0.300	0.100	0.016	0.035
74/01/05	11 15		0.156	0.800	0.232	0.012	0.040
74/01/19	10 00		0.300	0.400	0.088	0.024	0.065
74/02/09	10 10		0.240	0.300	0.085	0.025	0.065
74/02/24	09 45		0.232	0.300	0.065	0.020	0.055

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370581 LS3/05H1
35 47 30.0 0H1 17 00.0
UNNAMED CREEK
37 MAP CATAWBA CO
T/LAKE HICKORY
UNAMED FED AID SEC RD BRDG 2 NE HICKORY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/25	10 15		0.420	0.110	0.058	0.009	0.022
73/04/26			0.420	2.310	0.198	0.021	0.050
73/05/25	16 00		0.460	2.500	0.086	0.024	0.045
73/07/03	18 30		0.340	0.220	0.054	0.012	0.020
73/08/01	14 59		0.680	0.290	0.046	0.033	0.040
73/08/31	16 40		0.490	0.500	0.093	0.007	0.060
73/09/28	17 10		0.399		0.515	0.021	
73/11/01	17 15		0.340	0.750	0.084	0.014	
73/12/04	16 30		0.910	0.400	0.168	0.048	0.070
74/01/07	16 30		0.560	0.400	0.108	0.008	0.025
74/01/23	16 15		0.590	0.300	0.060	0.020	0.035
74/02/13	17 15		0.680	0.300	0.090	0.020	0.030
74/03/05	16 15		0.340	0.400	0.010	0.010	0.010
74/03/24	16 20		0.340	0.600	0.040	0.010	0.030

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STORET RETRIEVAL DATE 75/10/20

3705C1 LS3705C1
35 45 30.0 081 21 30.0
UNNAMED CREEK
37 MAP CATAWBA CO
T/LAKE HICKORY
UNAMED FAS RD .8 MI E OF US321 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/25	12 40		1.040	1.000	0.210	0.016	
73/04/26	14 45		0.540	3.000	0.190	0.078	0.270
73/05/26	11 30		0.660	0.600	0.036	0.015	0.030
73/07/02	15 00		0.530	0.720	0.064	0.012	0.035
73/08/01	15 30		0.580	0.540	0.037	0.029	0.055
73/08/31	15 15		0.440	0.240	0.069	0.016	0.045
73/09/28	15 45		0.520		0.380	0.031	
73/11/01	15 30		0.340	1.150	0.084	0.014	
73/12/04	14 45		0.610	0.300	0.024	0.040	0.090
74/01/07	15 00		0.840	0.500	0.028	0.048	0.145
74/01/23	14 35		0.870	0.100K	0.036	0.024	0.045
74/02/13	14 35		0.850	0.200	0.020	0.045	0.110
74/03/05	14 40		0.640	0.450	0.005K	0.020	0.047
74/03/24	14 50		0.820	0.900	0.020	0.010	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370501 LS370501
35 47 30.0 081 24 30.0
GUNPOWDER CREEK
37 MAP CALDWELL CO
T/LAKE HICKORY
BANK .1 MI E OF US 321
11EPALES 211120+
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/25	11 30		0.340	0.340	0.082	0.020	0.065
73/04/26	16 12		0.320	3.800	0.160	0.046	0.230
73/05/26	11 40		0.310	0.420	0.048	0.034	0.075
73/07/02	15 15		0.400	0.600	0.110	0.065	0.125
73/08/01	15 45		0.250	0.520	0.168	0.046	0.105
73/08/31	15 45		0.273	0.400	0.180	0.013	0.075
73/09/28	16 15		0.220		0.240	0.150	
73/11/01	16 00		0.330	1.550	0.252	0.067	0.230
73/12/04	15 10		0.370	0.800	0.088	0.112	0.460
74/01/07	15 25		0.490	0.400	0.140	0.052	0.130
74/01/23	15 00		0.430	0.500	0.120	0.036	0.160
74/02/13	15 05		0.420	0.400	0.148	0.055	0.115
74/03/05	15 10		0.400	0.600	0.130	0.085	0.140
74/03/24	15 20		0.384	0.400	0.115	0.030	0.115

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STORET RETRIEVAL DATE 75/10/20

3705E1 LS3705E1
35 50 30.0 081 21 30.0
UPPER LITTLE RIVER
37 MAP CALDWELL CO
T/LAKE HICKORY
RD 1740 BRDG 1.6 MI SE OF DUDLEY SHOALS
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/25	10 30		0.200	0.100K	0.012	0.005K	0.015
73/04/26	15 18		0.198	1.080	0.140	0.020	
73/05/26	11 30		0.126	4.100	0.090	0.008	0.020
73/07/02	15 10		0.180	0.200	0.044	0.011	0.015
73/08/01	16 10		0.150	0.150	0.025	0.007	0.025
73/08/31	16 20		0.130	0.100K	0.031	0.005K	0.025
73/09/28			0.115		0.198	0.005K	
73/11/01	10 20		0.055	0.900	0.080	0.008	0.010
73/12/04	15 40		0.140	0.100	0.020	0.008	0.010
74/01/07	15 45		0.232	0.300	0.028	0.008	0.015
74/01/23	15 20		0.240	0.100K	0.022	0.008	0.025
74/02/13	15 20		0.208	0.100	0.015	0.010	0.015
74/03/05	15 25		0.136	0.300	0.006	0.007	0.010
74/03/24	15 15		0.176	0.400	0.035	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

3705F1
35 50 35.0 081 17 00.0
MIDDLE LITTLE RIVER
37 MAP ALEXANDER CO
1/ LAKE HICKORY
ALEXANDER CO RD 1150 1.8 MI E BETHELEM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	11 15		0.198	0.150	0.039	0.026	0.026
73/04/15	14 30		0.170	0.150	0.033	0.005K	0.020
73/05/20	11 30		0.132	2.500	0.140	0.008	0.030
73/06/23	10 45		0.252	0.635	0.074	0.013	0.080
73/07/24	21 30		0.140	0.280	0.029	0.005K	0.030
73/08/14	10 30		0.154	0.600	0.090	0.013	0.120
73/09/28	10 30		0.270		0.390	0.026	
73/10/21	10 30		0.079	0.500	0.062	0.014	
73/11/11	15 45		0.052	0.250	0.040	0.005K	0.020
73/12/16	21 00		0.224	0.300	0.056	0.032	0.055
74/01/05	13 30		0.168	0.400	0.064	0.005K	0.015
74/01/19	11 00		0.192	0.100K	0.040	0.005K	0.015
74/02/09	15 15		0.148	0.400	0.060	0.005K	0.015
74/03/24	10 15		0.200	0.500	0.045	0.005	0.025

K VALUE KNOWN TO BE
LESS THAN INDICATED

112

STORET RETRIEVAL DATE 75/10/20

370SDA A5370SDA P003000
35 48 00.0 081 25 00.0
GRANITE FALLS NC
37173 CALDWELL CO HWY
1/LAKE HICKORY
LITTLE GUNPOWDER RIVER/GUNPOWDER RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/05/15	08 00								
CP(T)-			12.000	8.500	3.500	10.900	12.000	0.140	0.140
73/05/15	16 00								
73/06/30	08 00								
CP(T)-			2.500	8.200	0.610	6.400	7.700	0.110	0.140
73/06/30	16 00								
73/07/30	08 00								
CP(T)-			7.900	8.300	0.610	10.400	12.000	0.110	0.130
73/07/30	16 00								
73/08/31	08 00								
CP(T)-				12.100	0.410	2.580	3.200	0.140	0.170
73/08/31	16 00								
73/09/30	08 00								
CP(T)-			3.300	0.400	0.220	10.150	10.500	0.140	0.800
73/09/30	16 00								
73/10/31	08 00								
CP(T)-			4.200	2.100	0.061	9.900	12.000	0.140	0.150
73/10/31	16 00								
73/11/11	08 00								
CP(T)-			0.880	11.500	2.300	10.200	13.000	0.150	0.150
73/11/11	16 00								
73/12/31	08 00								
CP(T)-			0.640	22.000	7.900	4.700	9.200	0.140	0.140
73/12/31	16 00								
74/02/06	08 00								
CP(T)-			0.080	41.000	17.000	7.100	11.000	0.140	0.160
74/02/06	16 00								
74/02/28	08 00								
CP(T)-			0.040	15.000	4.700	11.500	13.800	0.140	0.800
74/02/28	16 00								
74/04/01	08 00								
CP(T)-			1.200	16.400	5.800	8.000	9.700	0.140	0.400
74/04/01	16 00								
74/05/02	12 00								
CP(T)-			1.120	33.000	12.500	11.000	15.000	0.140	0.400
74/05/02	16 00								

STORET RETRIEVAL DATE 75/10/20

17053AA Fr 3703AA P0006000*
35 43 40.0 081 17 32.0
MICKORY (SOUTEAST PLANT)
37 CATAWBA COUNTY
T/LAKE MICKORY
CLAWRE CREEK
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/08/08	10 00		0.270	4.600	1.200	1.400	2.100	1.000	0.750
73/09/07	11 00		0.440	11.400	1.100	3.020	3.500	1.000	0.750
73/10/15	13 00		0.450	8.300	2.800	3.150	4.200	1.100	0.500
73/11/08	11 30		0.630	48.000	25.000	5.400	5.500	1.000	0.500
73/12/11	11 30		0.570	5.200	1.050	1.470	1.950	1.000	0.500
74/01/11	12 00		1.120	1.100	0.780	0.980	1.130	1.000	0.500
74/02/11	15 00		1.400	3.500	1.850	1.320	1.950	1.250	0.500
74/03/14	15 00		0.440	8.300	3.400	2.700	3.250	1.300	0.500
74/05/27	15 30		3.000	5.700	2.100	1.950	2.200	1.000	0.500
74/06/20	13 30		1.520	12.000	4.500	2.583	4.500	1.500	0.500
74/07/11	13 30		1.850	5.400	2.200	1.500	2.400	1.200	0.500
74/08/07	13 30		0.450	8.500	1.950	1.750	3.000	1.100	0.500
74/09/05	16 00		1.750	13.500	4.900	4.300	5.200	1.300	0.500